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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/365,349 07/30/99 TERRY

N B99-085

EXAMINER

HM12/0424

RICHARD ARON OSMAN  
SCIENCE & TECHNOLOGY LAW GROUP  
75 DENISE DRIVE  
HILLSBOROUGH CA 94010

IBRAHIM M

ART UNIT

PAPER NUMBER

1638

DATE MAILED:

04/24/00

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trad marks**

# Office Action Summary

Application No.

09/365,349

Applicant(s)

Terry et al

Examiner

Medina A. Ibrahim

Group Art Unit

1638

☒ Responsive to communication(s) filed on Feb 9, 2000

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1035 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

## Disposition of Claim

☒ Claim(s) 1-24 is/are pending in the application.

Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

☐ Claim(s) \_\_\_\_\_ is/are allowed.

☒ Claim(s) 1-24 is/are rejected.

☐ Claim(s) \_\_\_\_\_ is/are objected to.

☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.

## Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on \_\_\_\_\_ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some\* ☒ None of the CERTIFIED copies of the priority documents have been received.

☐ received in Application No. (Series Code/Serial Number) \_\_\_\_\_.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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### **DETAILED ACTION**

The Group and/or Art Unit location of your application in the PTO has changed. To aid in correlating any papers for this application, all further correspondence regarding this application should be directed to Group Art Unit 1638.

Claims 1-24 are pending in the application.

Claims 20-24 are newly added.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Withdrawn Objection and Rejections***

The 35 U.S.C. 112, 2nd paragraph rejection to claims 5-6, 9-13 and 18 has been withdrawn in view of Applicants' amendment in page 1 of the response filed on February 9, 2000.

### ***Claim Rejections - 35 USC § 102***

Claims 1-2, 5-8, 13-15 and 19 remain rejected and new claims 20 and 22 are rejected under 35 U.S.C. 102(a) as being anticipated by Arisi et al. This rejection is maintained for the reasons set forth in page 3 of the last office action for claims 1-2, 5-8, 13-15 and 18-19.

Applicants arguments in page 2 of the response filed 02/9/2000, have been fully considered but are not found persuasive.

Applicants traverse that Arisi et al, who teach transgenic poplars (hybrid from *Populus tremula* x *P. alba*) overexpressing a gamma-glutamylcysteine synthase encoded by *E. coli* gshI under the control of an enhanced CaMV 35 S promoter and wherein the transgenic plant is

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phenotypically indistinguishable from the untransformed plant, do not provide transgenic poplars with enhanced heavy metal accumulation. Applicant continues that Arisi's poplars do not meet and can not meet or suggest the limitations of their claims, as evidenced by references cited with response of February 3, 2000.

Examiner responds that instant claims are drawn to a plant transformed with a gene encoding an overexpressed glutamylcysteine synthase under the control of a heterologous promoter, wherein the overexpressed glutamylcysteine synthase provides an enhanced accumulation of heavy metals, and wherein the transgenic plant exhibits normal growth. Arisi et al teach transgenic Poplars overexpressing E.coli ECS under the control of an enhanced CaMV 35S promoter, where in a **preliminary** experiment by Noctor et al, the transformed and untransformed plants have shown a similar extent of Cd accumulation. However, Noctor et al evaluate Cd accumulation in poplar plants grown in soil ( page 640, column 1, bottom paragraph); while Applicant's only reduction to practice involves hydroponic or agar culture of a single genotype of Brassica juncea ( page 8 of the specification, bottom paragraph; page 9, line 15 to page 10, line 6). Thus the applicability of Noctor et al to the instant application is unclear.

Examiner continues that Arisi et al suggested , with a reasonable expectation of success, a further study on heavy metal tolerance in transgenic plants overexpressing ECS . In addition, Applicants' own specification ( see, pages 7-8, Table. 1) reveals a list of different plant species including , a Populus species, overexpressing the same gene, namely E.coli gshI and the same promoter, namely enhanced 35S CaMV ( used similarly by Arisi et al); these plants are

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prophetically shown to have an enhanced heavy metal accumulation. What is unclear in this situation is the special property of the genetic construct comprising the E.coli gene and the enhanced 35S CaMV promoter in which the overexpression of ECS in all the different plant species listed in Table 1 of the instant specification could result heavy metal accumulation, while Arisi's Populus species could not. Applicant is encouraged to clearly point out and claim the patentable novelty with regard to genetic construct or recipient plant genotype which he or she thinks the claims present in view of the state of the art disclosed by the references cited . Examiner asserts that Arisi et al fully anticipate the claimed invention.

***Claim Rejections - 35 USC § 103***

Claims 1-19 remain rejected and new claims 20-24 are rejected under 35 U.S.C. 103 as being obvious over Raskin et al in view of Watanabe et al, and further in view of Chen et al. This rejection is maintained for the reasons set forth in pages 4-5 of the last office action. Applicants' arguments in pages 3-4 of the response filed 02/9/99, have been fully considered but are not found persuasive.

Applicant argues that the instant claims are not obvious over the combination of Raskin et al who teach transgenic Brassica Juncea overexpressing metallothioneins (MT's) for heavy metal accumulation from contaminated soil, Watanabe et al who teach the E.coli gshI encoding ECS, and Chen et al who teach tomato cell, overexpressing ECS ( an enzyme for biosynthesis of PC, a metallothioneine ), selected for cadmium tolerance. Applicant continues that Chen et al

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acknowledges that the relationship between ECS activity, GS, phytochelatin synthesis, heavy metal tolerance and heavy metal accumulation are by no means clear. Applicant continues to cite Chen et al page 238 , columns 1, 2, to emphasize<sup>e</sup> the uncertainty between phytochelatin synthesis and Cd tolerance. Applicant asserts that Chen et al suggested future development of transgenic plants with altered level of GSH or PCS for increasing Cd tolerance. Applicant also asserts in page 3, last paragraph, of the response filed on 02/3/200 that Goldsbrough ( 1999) reports that ECS could restore some degree of Cd tolerance in Arabidopsis Cd-sensitive mutant while this gene did not increase Cd tolerance of wildtype plants.

Examiner responds that instant claims are drawn to a plant including Arabidopsis transformed with a gene encoding an overexpressed glutamylcysteine synthase under the control of a heterologous promoter, wherein the overexpressed glutamylcysteine synthase provides an enhanced accumulation of heavy metals, and wherein the transgenic plant exhibit normal growth. As explained in the last office action, Raskin et al teach that Brassica juncea overexpressing metallothioneins accumulate heavy metals from metal contaminated soil, Watanabe et al teach the E.coli gshI encoding ECS, and Chen et al teach a tomato cell overexpressing ECS selected for Cd tolerance. The relationship between ECS ( encoded by gshI) and GS ( encoded by gshII) are two separate enzymes required for the synthesis of the PC, namely GSH which has very much a defined role in plants' tolerance against heavy metal stress ( see, also Noctor et al paragraph bridging pages 623 and 624). Examiner continues that Chen et al in page 238, columns 1-2 compares the concentration of GSH level between two tomato cell lines at two Cd concentration

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level (0.3mM and 0.1 mM of CdCl). There is no where in page 238 that refutes the involvement of ECS in relation to Cd intolerance in plants. Furthermore, Goldsbrough's report reports that ECS could restore some degree of Cd tolerance in Arabidopsis Cd-sensitive mutant while the gene did not increase Cd- tolerance of wild-type plants is expected since a wildtype Arabidopsis could be naturally Cd- tolerant, and provides a positive result which supports the Examiner's position. Therefore, instantly claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made including Brassica juncea with a MTgene as taught by Raskin et al, and to modify that method by incorporating Watanabe et al gene encoding ECS to produce transgenic plant overexpressing ECS for an enhanced heavy metal tolerance as taught by Chen et al. Examiner concludes that instant invention would have obvious at the time was made over any combination of Raskin et al, Watanabe et al, and Chen et al, with a reasonable expectation of success.

### *Conclusion*

Applicants's amendment necessitated the new grounds of rejection presented in this office action. Accordingly, **THIS ACTION IS MADE FINAL**. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Medina A. Ibrahim whose telephone number is (703) 306-5822. The examiner can normally be reached on Monday through Friday from 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynette Smith, can be reached on (703) 308-3909. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-7401.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0196.

April 20, 2000  
mai

DAVID T. FOX  
PRIMARY EXAMINER  
GROUP 180-1638

*David T. Fox*